

Appendix C

Runoff Management Practices

Water Management

Field stockpiles and constructed storage facilities with vehicle access points at or below ground-level such as concrete pads may be vulnerable to surface runoff. Methods for managing surface runoff include:

- Careful site selection and evaluation to assess expected volume of precipitation and runoff during planned storage periods, and optimizing topographic location to minimize exposure to runoff or flooding. Good site selection can frequently eliminate the need for additional runoff controls.
- Minimizing the amount of direct precipitation and upslope runoff encountering stored material through use of stormwater diversions, shaping of stockpiles roofing, or enclosing the facility.
- For constructed facilities, properly managing water that comes into contact with the residual material through collection of accumulated water, or for field stockpiles, use of filter strips and buffer zones.
- For constructed facilities, sumps or gravity flow can be used for transport of accumulated water to on-site filter strips or treatment ponds. Water can also be mixed with the residual for land application, decanted, and transported to off-site treatment facilities or irrigation systems (taking care not to exceed hydraulic loading rates to prevent ponding or run-off).

Best Management Practices

Grassed waterways: Are shaped and graded channels that are protected with vegetation, stone or other materials to carry surface water at a non-erosive velocity to a stable outlet. The vegetation in the waterway protects the soil from erosion caused by concentrated flows, while carrying water down slope. Grassed waterways may be used as outlets for diversions or to convey water to treatment ponds or filter areas. Waterways should be inspected periodically, any eroding areas should be repaired and they should be mown, reseeded and fertilized as needed to maintain good vegetative cover.

Provide stabilized machinery crossings, where needed, to prevent rutting of the waterway. Waterways should not be crossed when wet.

Silt Fence

Temporary barriers of woven geotextile fabric (approximately two feet high) are used to filter surface runoff, reduce its velocity and trap sediment from disturbed areas. Silt fences can only be used to intercept sheet flow, they cannot be used in swales or other areas where the flow of water is concentrated.

Silt fences are installed on or parallel to contours. To work effectively, the bottom of the entire length of the fabric must be placed in a trench or slot in the soil and back filled. This ensures a continuous seal with the ground, so that water and sediment will be trapped and not pass under the fence. To ensure that a silt fence is not knocked down or overwhelmed with sediment, the maximum length of a silt fence is proportional to slope steepness and length. Consult your local natural resource conservationist for specifications applicable to your site. Silt fence should be inspected after each rainfall event and maintained when bulges occur or when sediment accumulates to 50 percent of the fence height (See also Figure C-1).

Straw Bale Dikes

Straw bale dikes are temporary measures used to filter sediment from sheet flow runoff so that deposition of transported sediment can occur. Straw bale dikes clog and deteriorate rapidly and require frequent maintenance. Bales should be placed in a row on the contour with the ends of each bale tightly abutting the adjacent bales and securely anchored in place with stakes. Bales should be entrenched several inches in the soil to ensure a good seal with the ground to prevent water and sediment from flowing under the bales instead of through them (See also Figure C-2).

Filter Strips

A strip or area of grass or other vegetation that removes sediment, organic matter, nutrients and other pollutants from runoff and wastewater by filtration, infiltration, absorption, adsorption, decomposition and volatilization. In many cases there may be enough natural vegetation present to filter pollutants. If not, a filter area can be planted alone or in combination with existing natural vegetation. This practice may

be applied downslope of long term stockpiles, or storage facilities, at the lower edges of fields or adjacent to streams, channels, or ponds.

Filter strips are designed to handle sheet flow of surface runoff. If any storm water management practice, such as a grassed waterway deliver water to these areas they must be designed with outlets that distribute and slow the concentrated flow of water into an even sheet across the top edge of the filter. Grassed filter strips are placed along the contour. They must be long enough and wide enough so that peak sheet flow does not exceed the maximum permissible depth (e.g. one-half-inch) and so that the time it takes the water to pass through the filter provides the necessary level of pollutant removal and treatment. Filter strips should be protected from damage by farm equipment and vehicle traffic. They should be inspected regularly to ensure that the area remains properly vegetated and that no gullies or areas of concentrated flow develop to short circuit the system. Any necessary reseeding or reshaping should be done promptly.

Berms/Earth Dikes

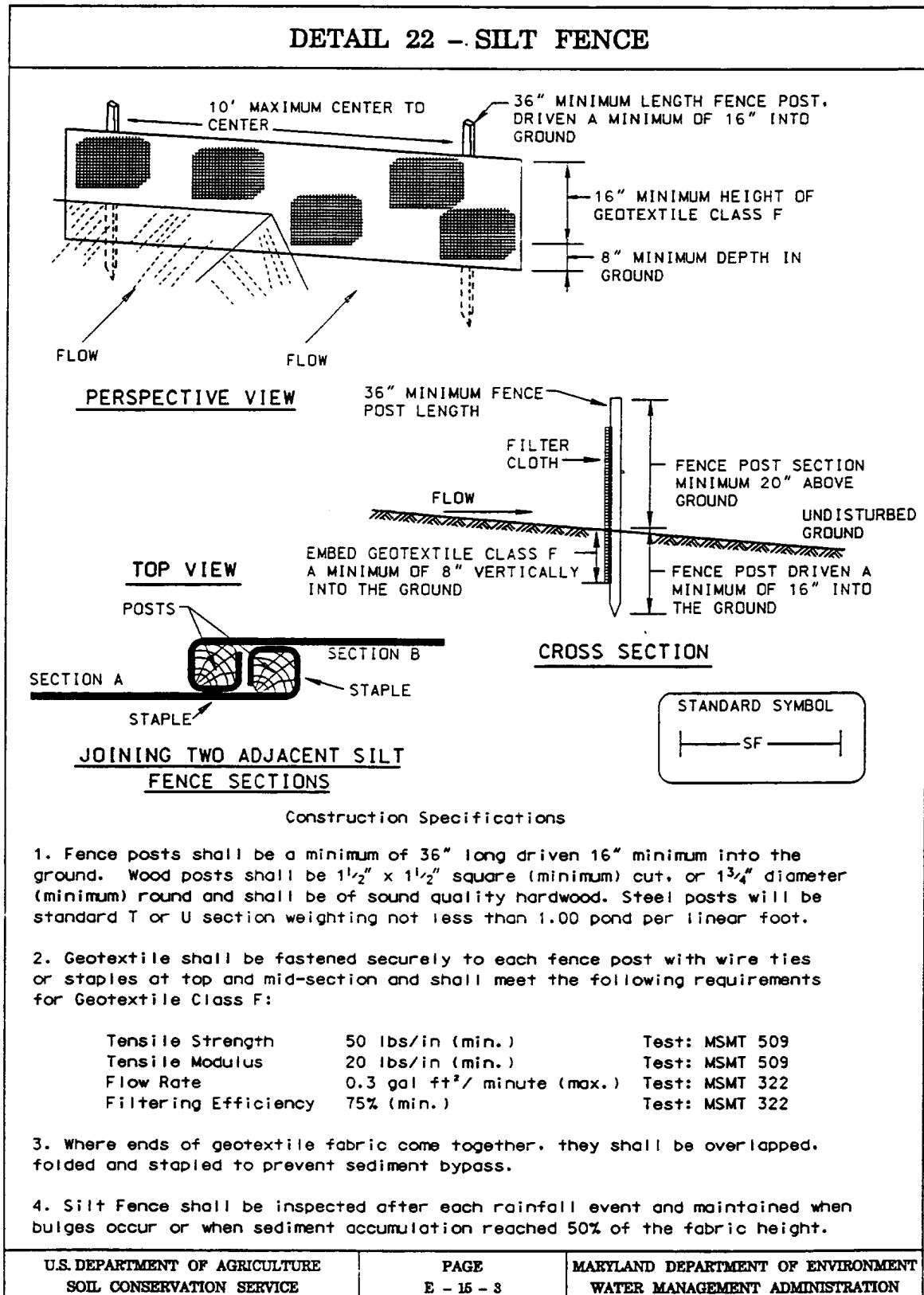
A temporary earthen ridge of soil, shaped along the contour and compacted, to divert runoff around a stockpile or constructed storage area. Berms intercept up-slope sheet flow and outlet to an undisturbed stabilized area or watercourse at a non-erosive velocity. For temporary stockpiles berms may be created with on-farm tillage equipment. Berms should be sized to the upslope drainage area. If necessary, depending on soil type and the expected length of storage, the berm should be stabilized by seeding or mulching. Berms should be regularly inspected and maintained to ensure they are not breached or eroded. Following removal of the field stockpile, berms should be removed and the area returned to its original grade (See also Figures C-3 and C-4).

Diversions

A channel constructed across a slope with a supporting ridge on the lower side used to divert clean runoff water away from a storage area. Diversions prevent clean runoff from coming into contact with stored biosolids and protect down-slope areas from erosion. A diversion must discharge runoff water to a stable outlet at non-erosive velocities. The outlet may be a grassed waterway, a vegetated area, or a stable watercourse. Diversions should be compacted and stabilized by seeding, and regularly inspected. Repair and reseed any bare areas immediately, keep channel and outlet clear of debris, keep burrowing animals out of the bank; mow, reseed, and fertilize as needed to maintain vegetation.

Heavy Use Protection

For long term stockpiles or permanent storage facilities, protect loading and other areas from erosion with gravel or paving, as necessary.



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Figure C-1. Silt Fence Design Diagram

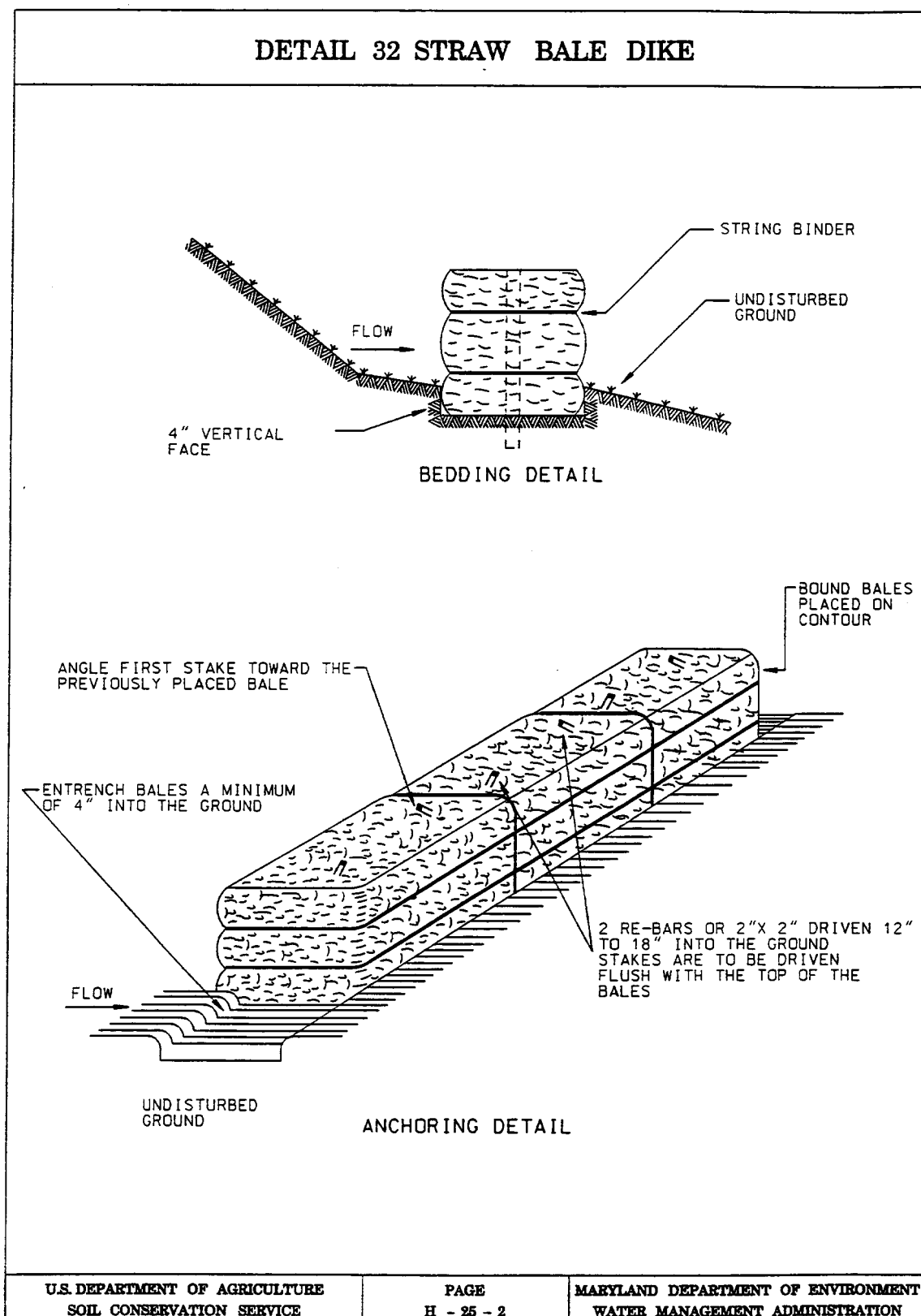
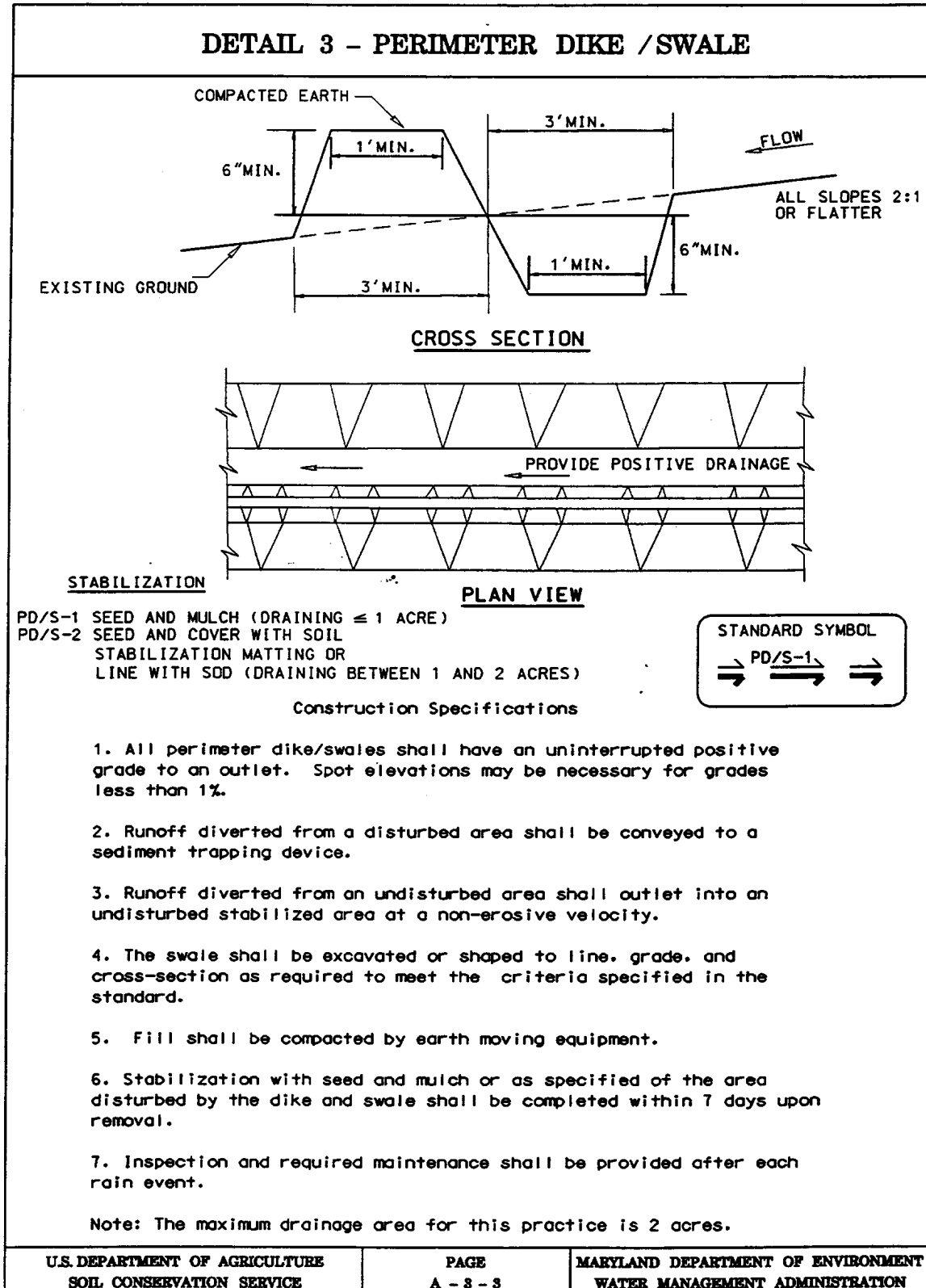


Figure C-2. Straw Bale Dike Design Diagram



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Figure C-3. Perimeter Dike/Swale Design Diagram

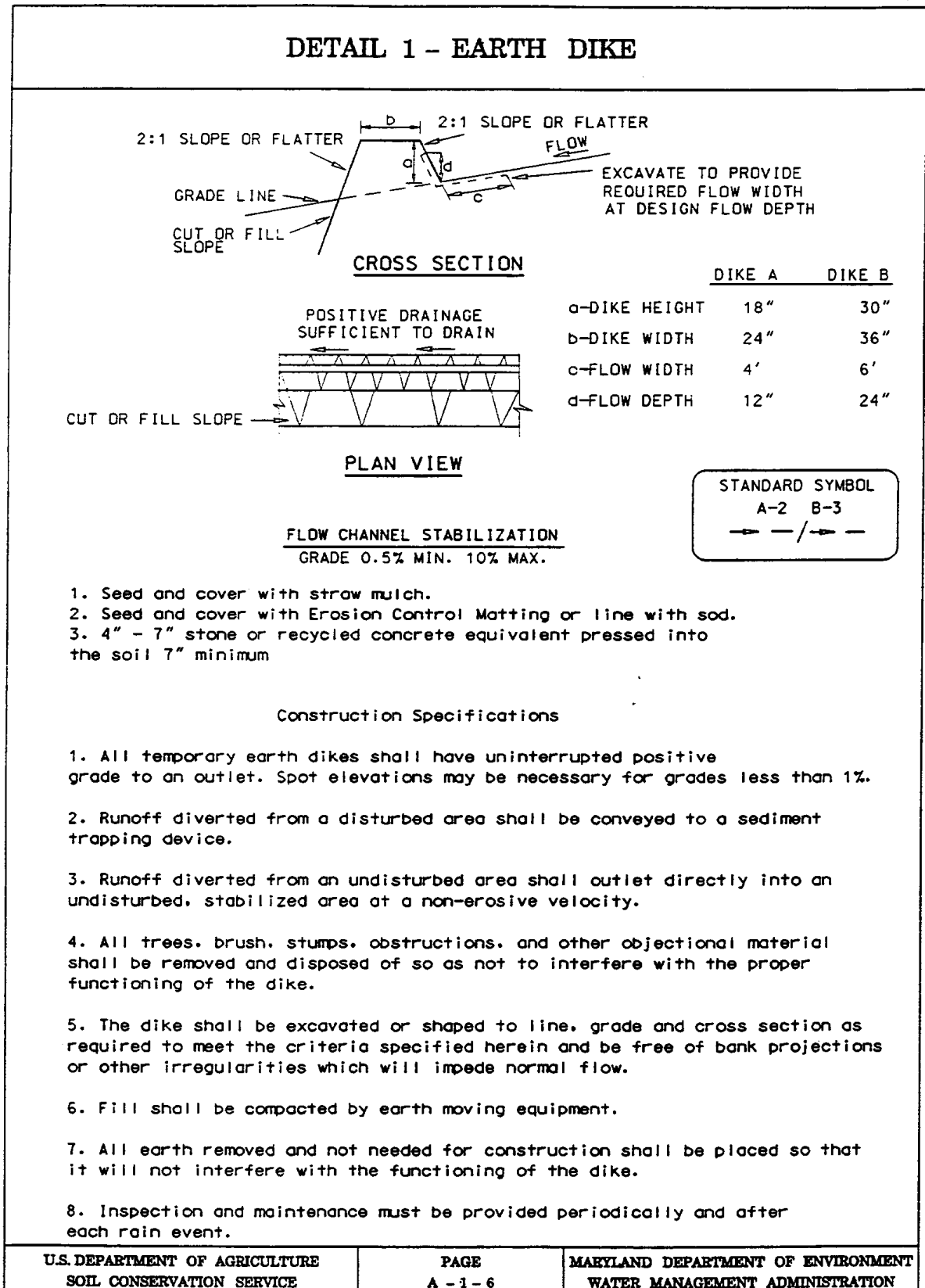


Figure C-4. Earthen Dike Design Diagram.

Natural Resources Conservation Service Regional Conservationists

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Eastern Office	Phone: 301-586-1387 or 1388 Calverton Office Bldg. #2 Suite 100 11710 Calverton Blvd. Beltsville, MD 20705
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Northern Plains Office	Phone: 402-437-4082 100 Centennial Mall North Room 152, Federal Building Lincoln, NE 68508-3866
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South Central Office	Phone: 817-334-5224 501 W. Felix St., Bldg. 23 Felix & Hemphill Street Ft. Worth, TX 76115
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